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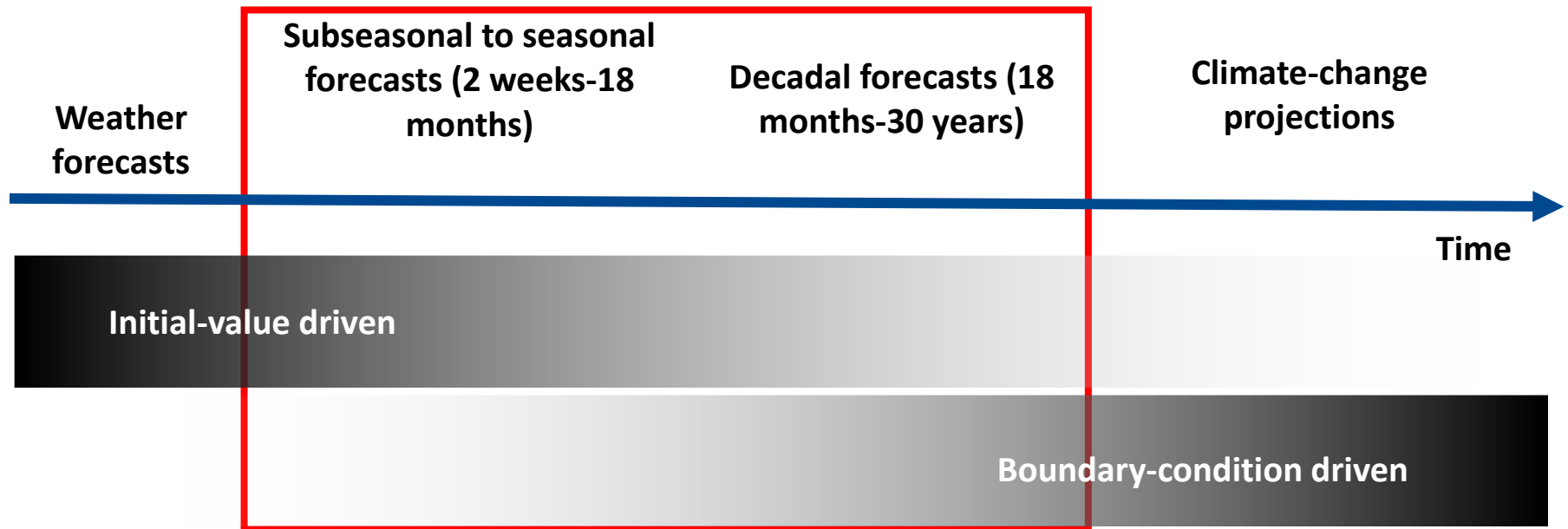
Skill assessment of seasonal forecast systems

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Chloé Prodhomme, Niti Mishra

BSC Earth Department
Climate Prediction Group



Progression from initial-value problems with weather forecasting at one end and multi-decadal to century projections as a forced boundary condition problem at the other, with climate prediction (**sub-seasonal, seasonal and decadal**) in the middle. Prediction involves initialization and systematic comparison with a **simultaneous** reference.

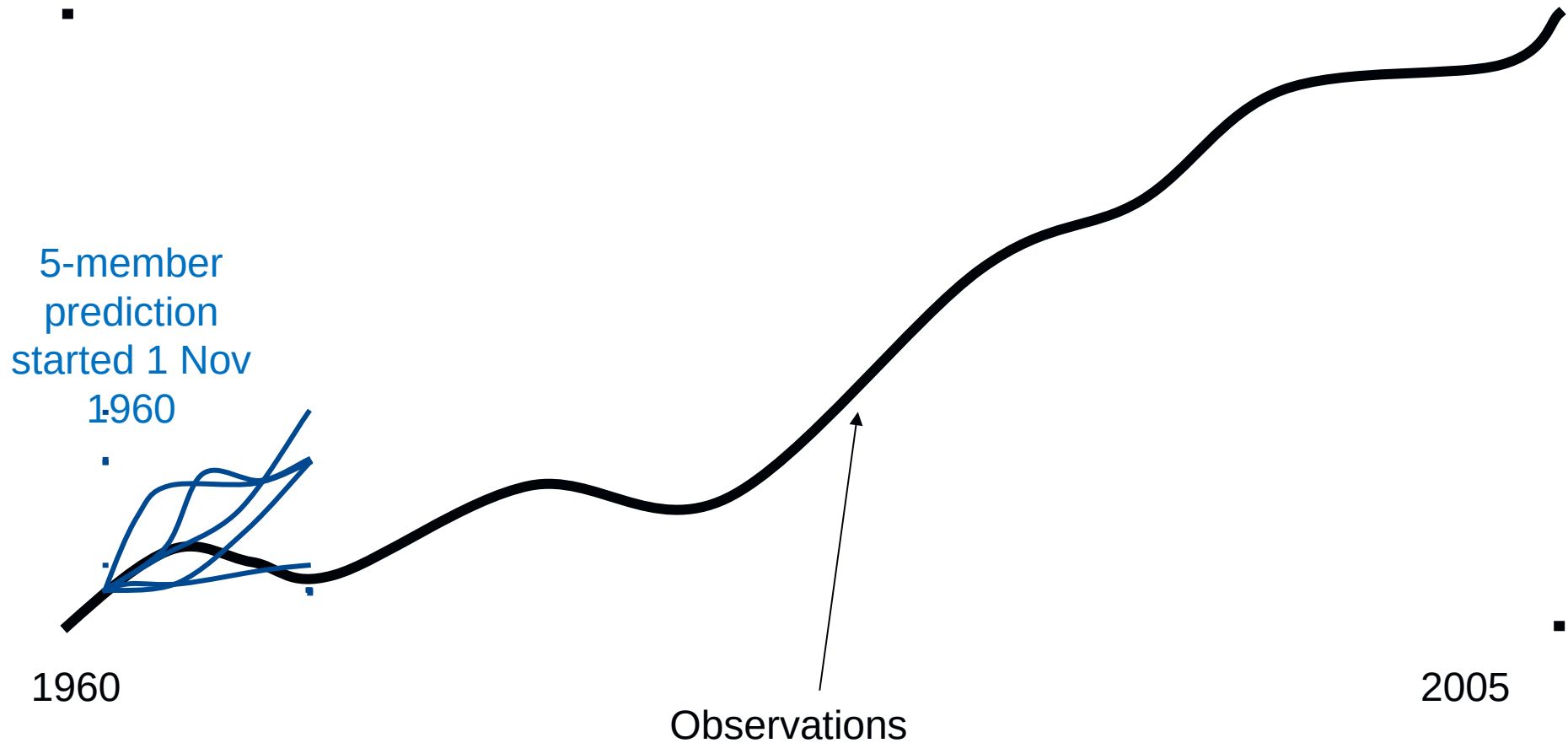


Adapted from Meehl et al. (2009)

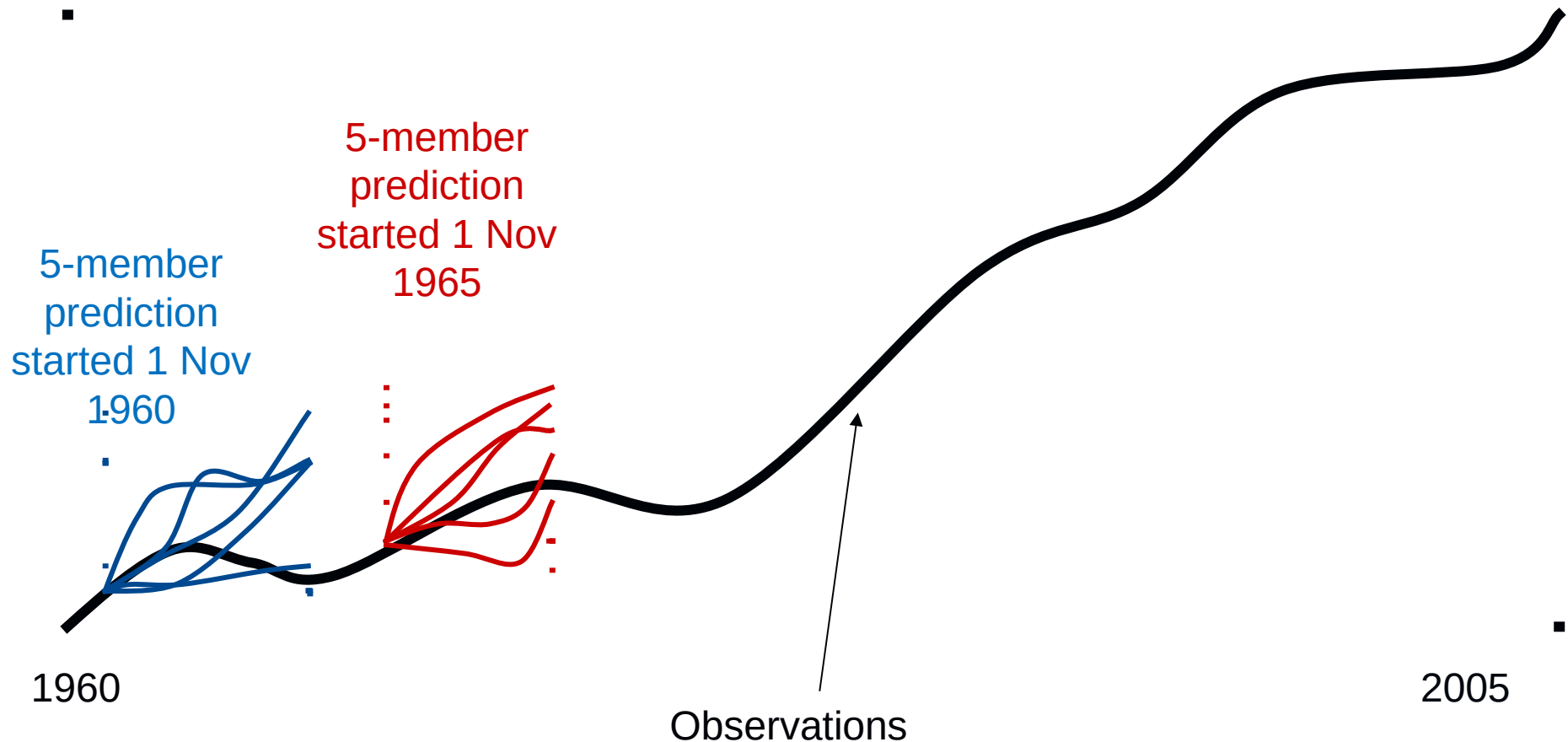
Climate prediction experiments



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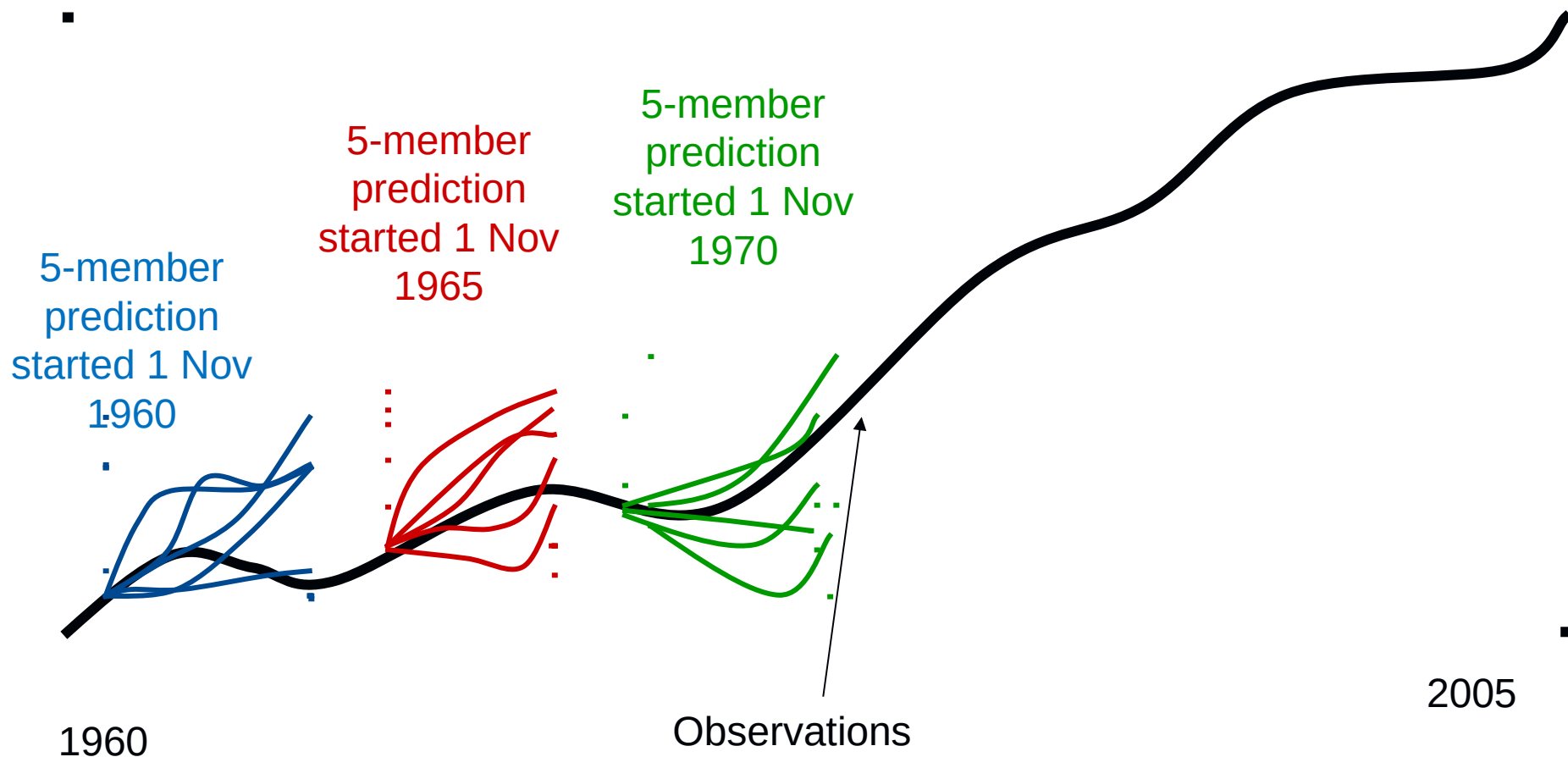
Climate prediction experiments



Climate prediction experiments



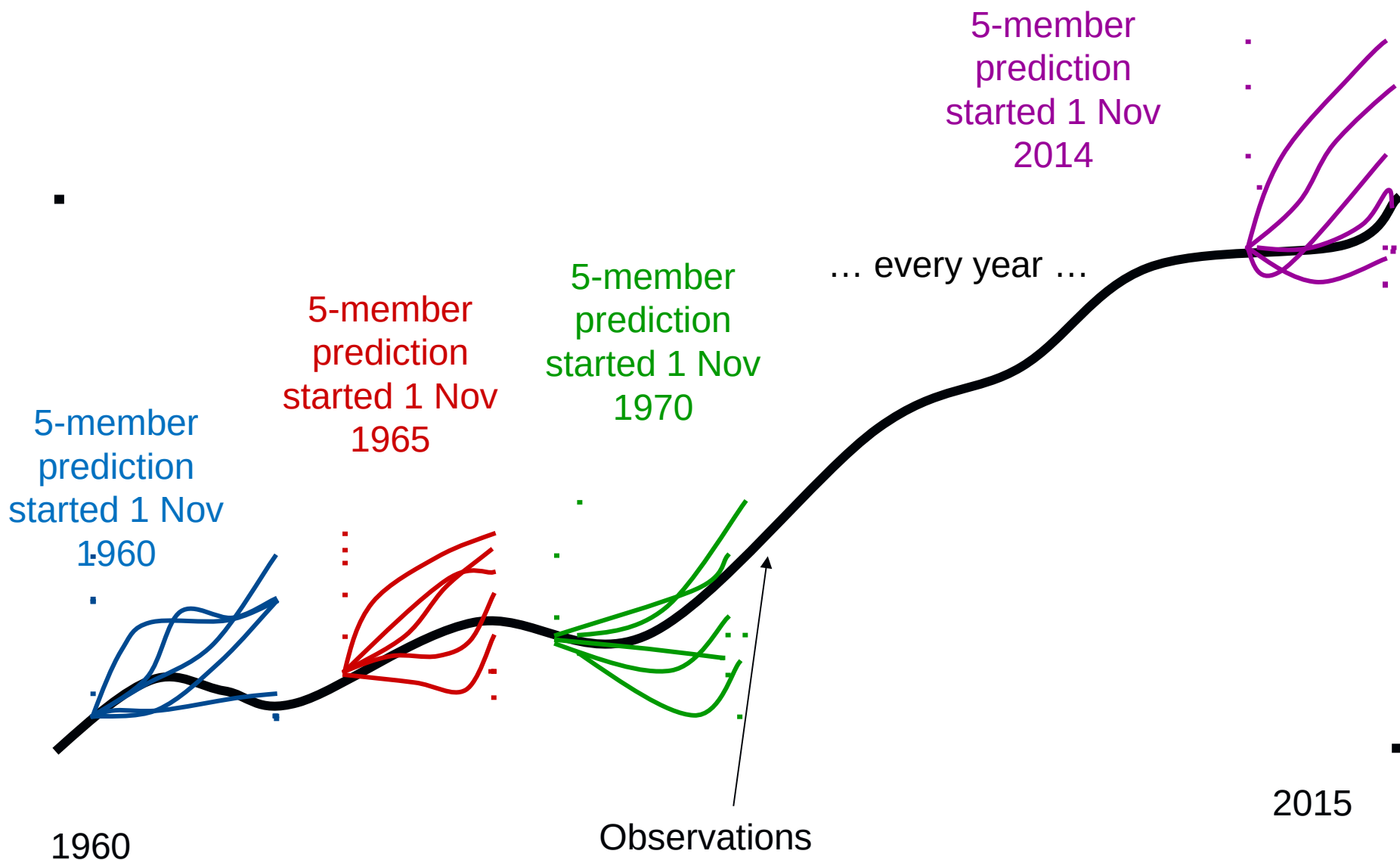
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Climate prediction experiments



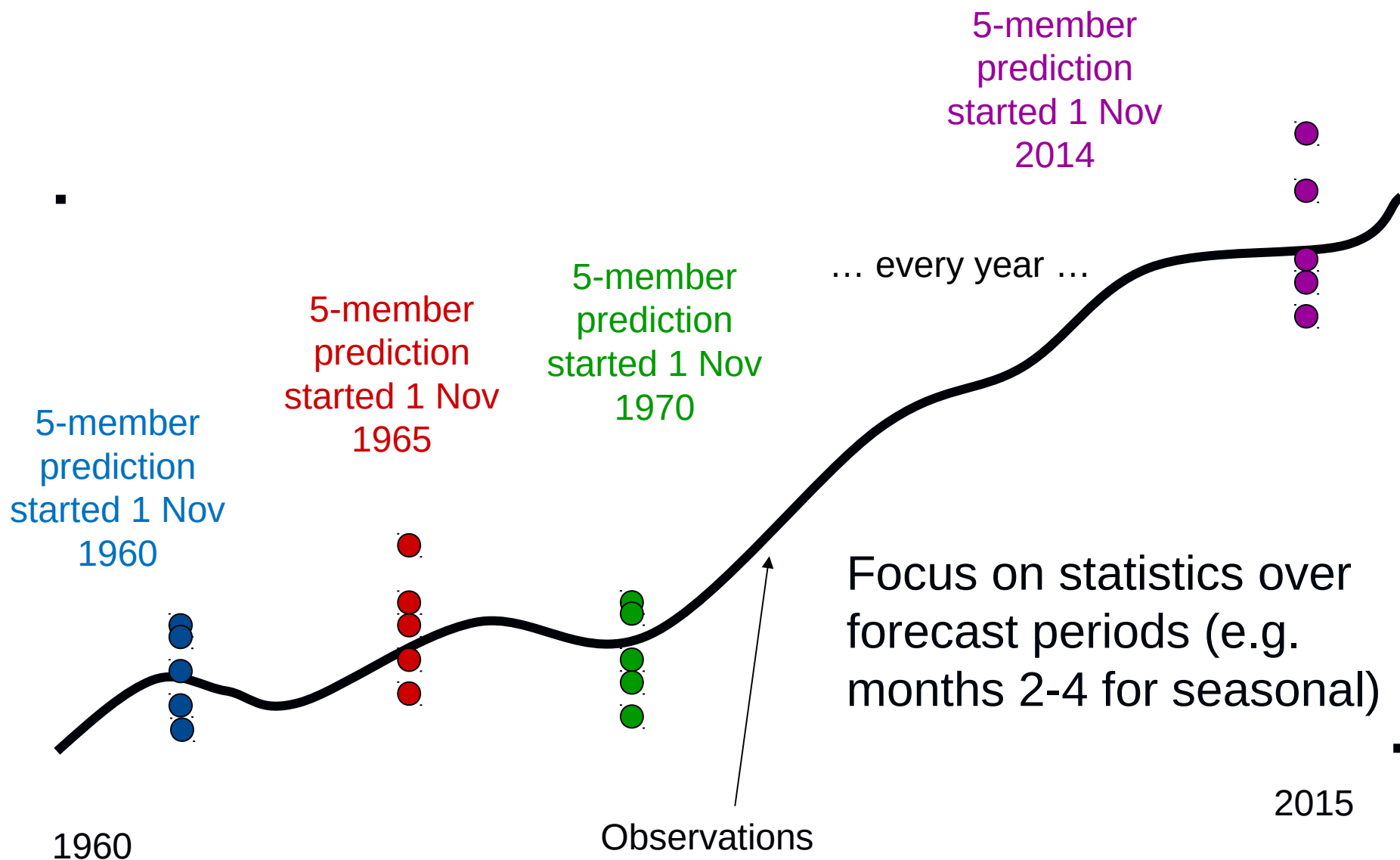
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Climate prediction experiments



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- ECMWF S4

51 Members for May and November start date. 15 otherwise.

Atm: IFS 36r4 ~70km

Ocean: NEMO ~100km

- GloSea5 (UK Met Office)

24 members generated 1 day moving start dates

Atm: HadGEM3 ~50km

Ocean: NEMO ~25km

- MeteoFrance S4

8 members

- CFSv2 (US NCEP)

24 members

We assess the skill using all the
members available
over the common period
1992-2012

- All available on demand from BSC – WP3 MS8

Skill of the Multi-Model Mean



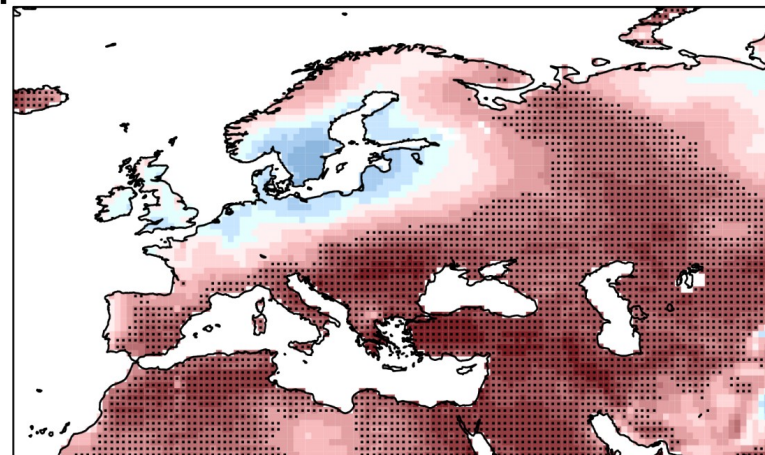
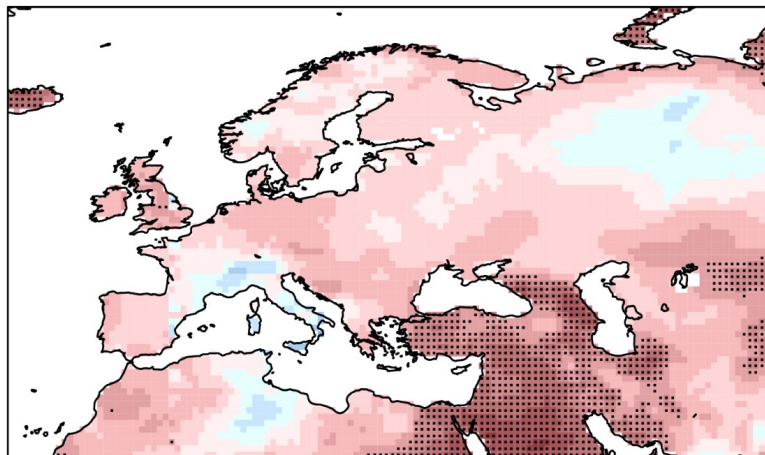
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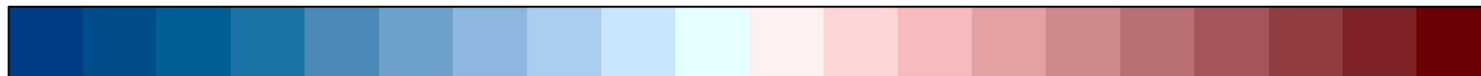
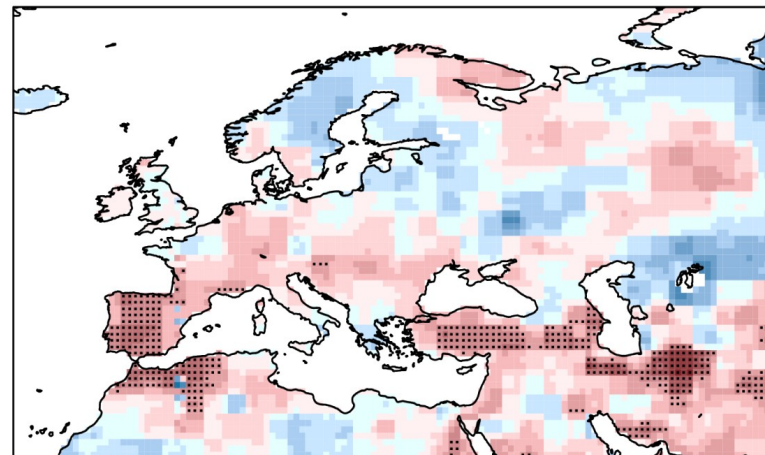
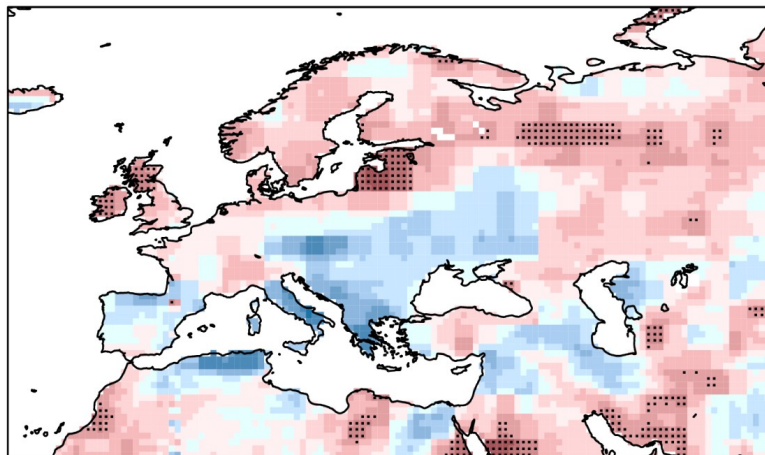
Winter (DJF)

2m-temperature

Summer (JJA)



Precipitation



-1

0

1

Skill of individual systems (summer)



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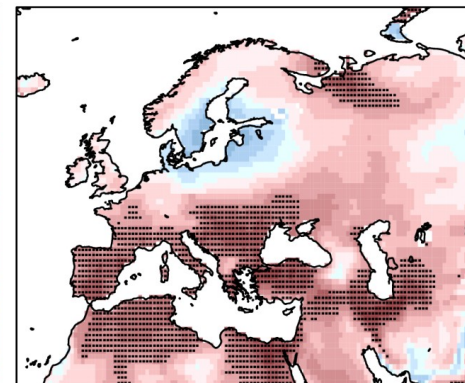
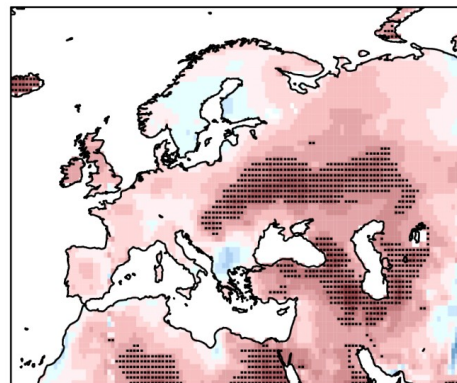
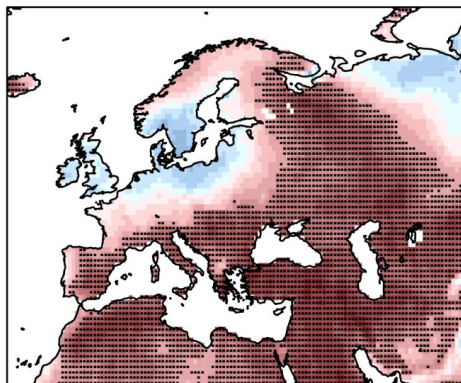
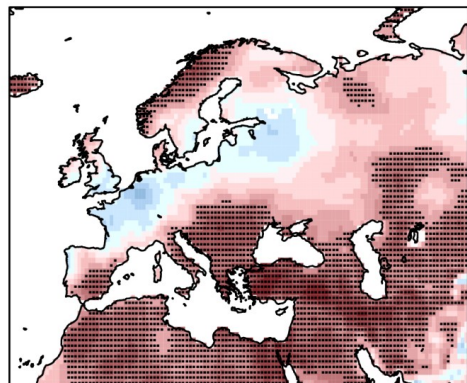
2m-temperature

GloSea5

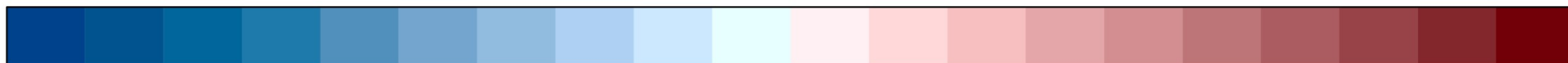
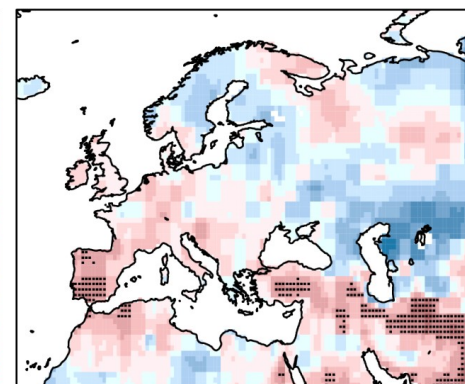
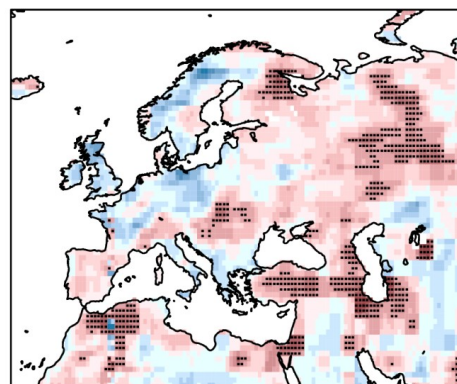
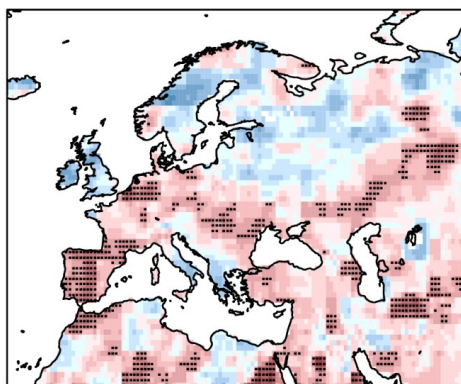
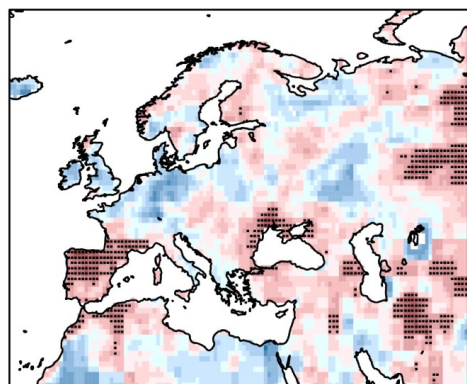
ECMWF

NCEP

MeteoFrance



Precipitation



-1

0

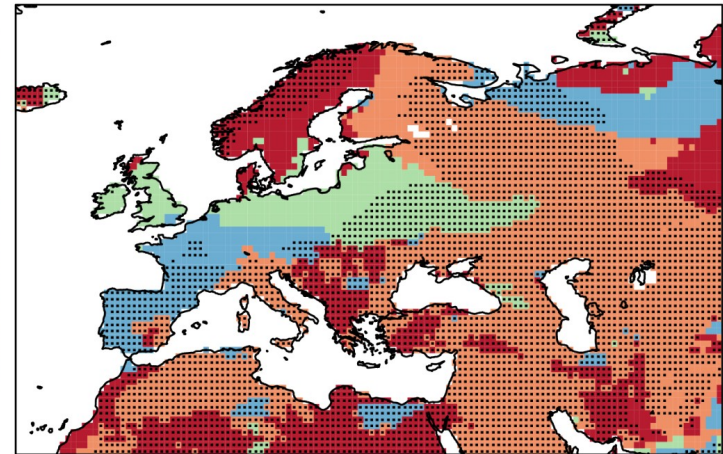
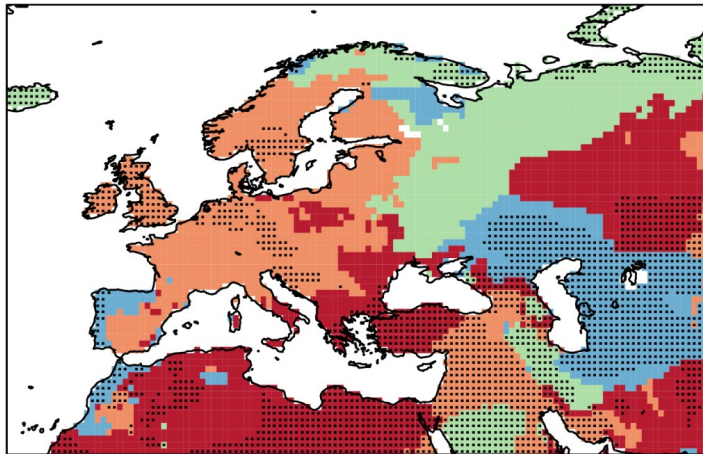
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Which is the “best” system?

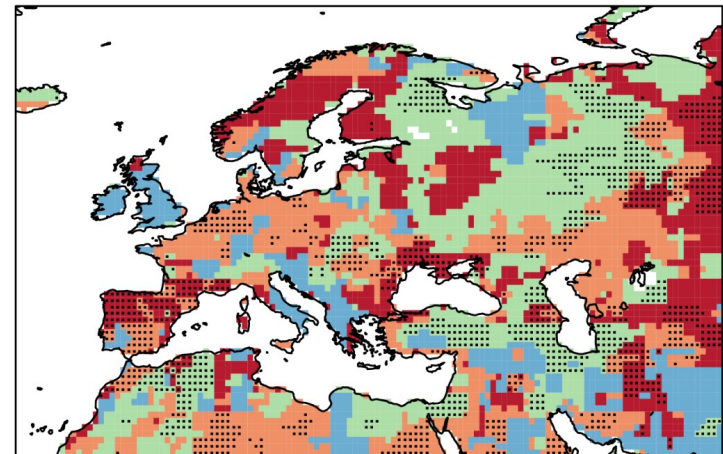
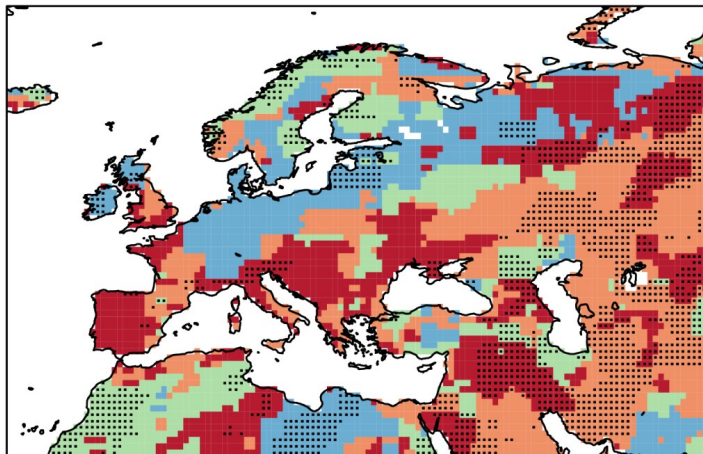
Winter (DJF)

2m-temperature

Summer (JJA)



Precipitation



- **EC-Earth spatial resolutions**
 - Standard Resolution (T255) ~80 km
 - High Resolution (T511) ~40 km
 - Very High Resolution (T1279) - develop ~16 km
- **Sources of predictability**
 - ENSO (El Niño/Southern Oscillation) – in the tropics
 - NAO (North Atlantic Oscillation)
 - Soil moisture
 - Snow cover
 - Arctic sea ice extent
 - Green house gases (decadal/climate change)

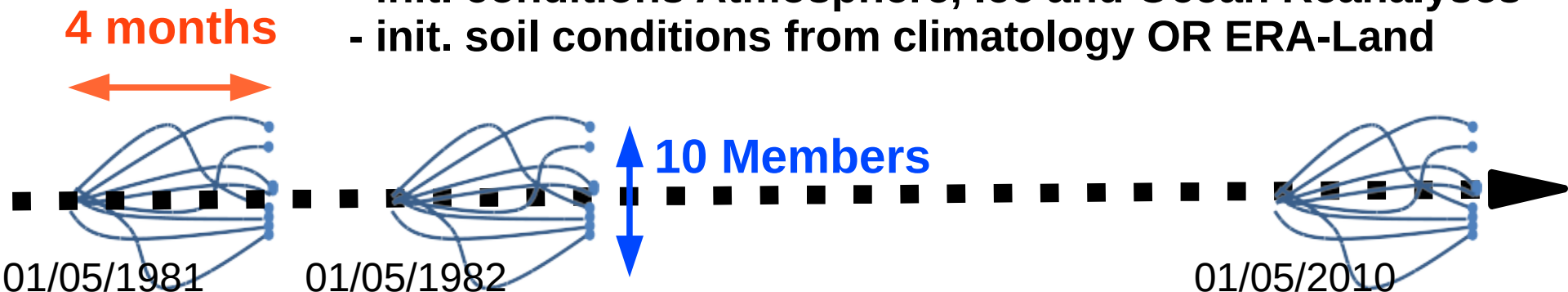
The EC-Earth forecast system



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- 20 individual, 4 month climate predictions (May-August)
- init. conditions Atmosphere, Ice and Ocean Reanalyses
- init. soil conditions from climatology OR ERA-Land



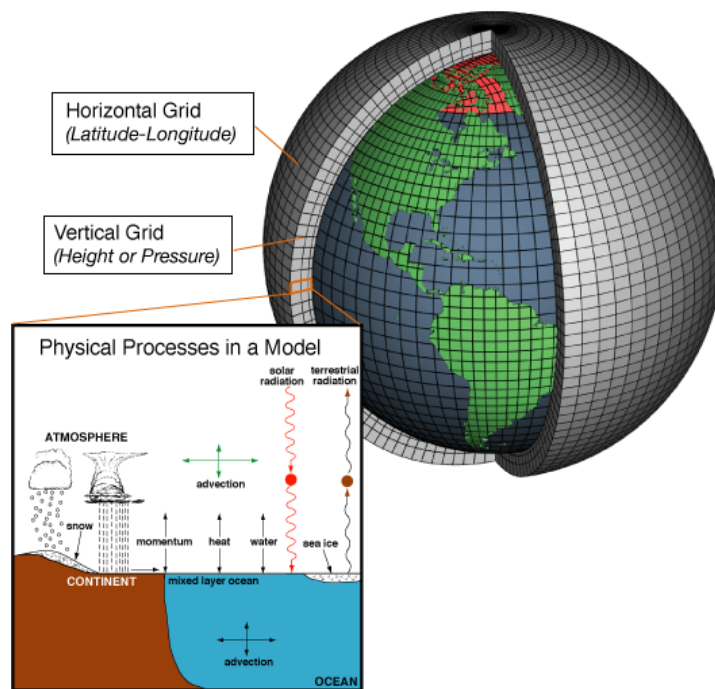
**Atmosphere
Reanalysis
(ERA-Interim)**

**Ice
Reanalysis
(IC3/BSC)**

**Land reanalysis
(ERA-Land)**

**Ocean reanalysis
(ECMWF S4)**

EC-Earth coupled model



Impact of Land Surface Initialization



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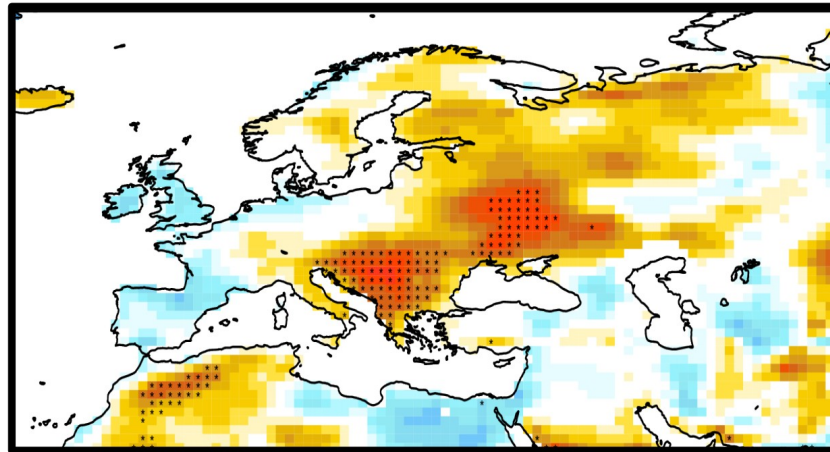
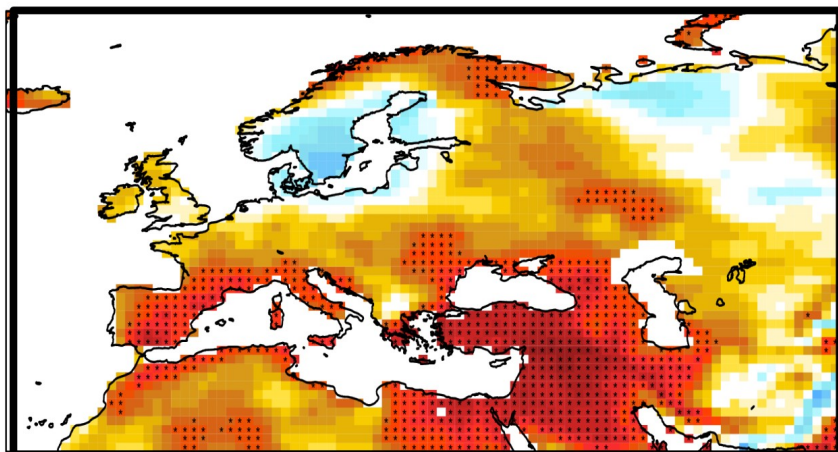
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CLIM

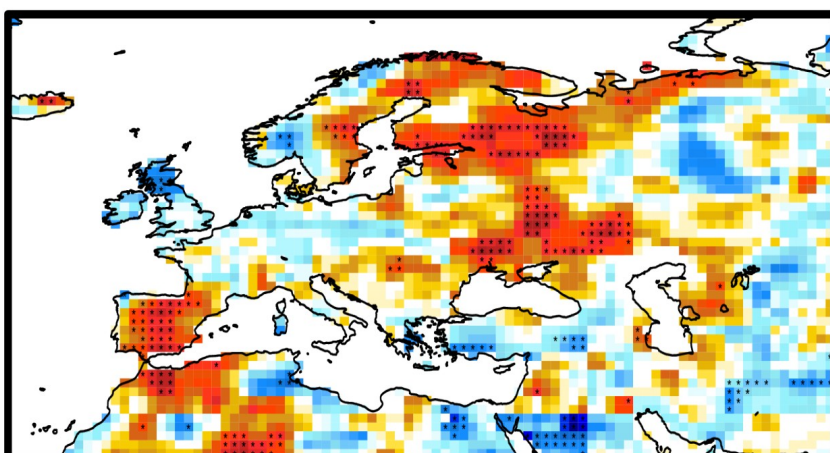
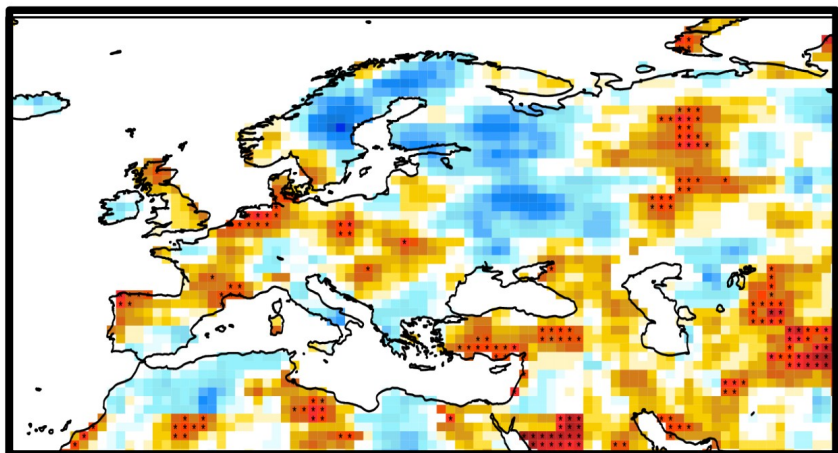
2m-temperature

INIT-CLIM

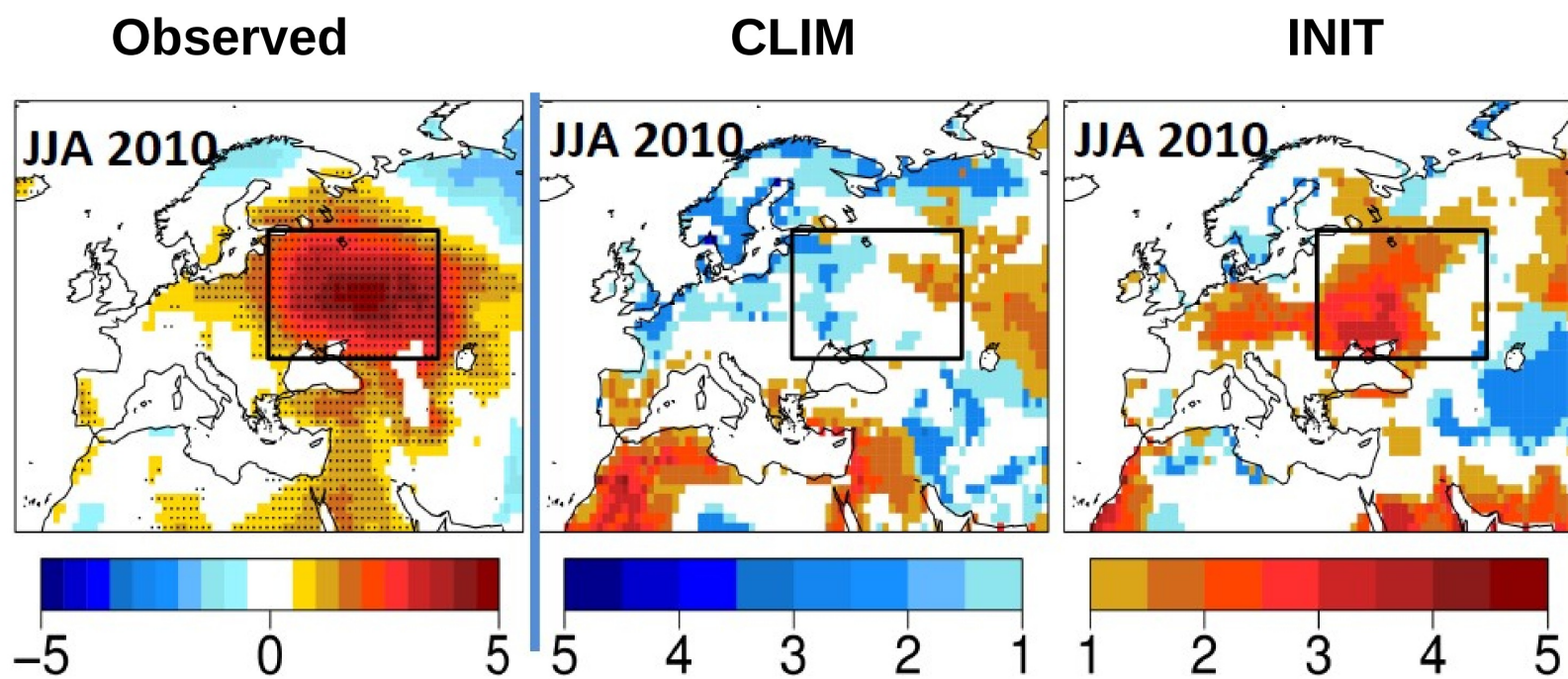
*Prodhomme
et al. 2015*



Precipitation



Seasonal prediction of Russian heat wave initializing observed land-surface (INIT) conditions and climatological (CLIM) conditions. Land-surface initialisation matters.



- Seasonal forecast exhibits limited skill over Europe in particular for precipitation.
- Choosing the correct forecast for your purpose is essential (region, season and variables). There might exist a “window of opportunity” for your specific purpose.
- Land surface initialization improves the prediction skill of temperature and precipitation over Europe.



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Thank you!

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